Low-Q Diffractometer (LQD)

The Low-Q Diffractometer (LQD) is designed to study long length scale structures with dimensions from 10 to 1000 Å. Examples of problems that LQD can help solve include phase separation, morphology, and critical phenomena in hard and soft matter and in magnetic structures, colloid and polymer structure, biomolecular organization, and bubble formation in metals. A significant feature of the LQD is that it accesses a broad range of Q (0.003 to 0.5 $Å^{-1}$) in a single measurement by using the time-of-flight (TOF) technique without any changes to the instrument's physical configuration. The LQD uses an intense source of long-wavelength ("cold") neutrons over a range of 1 to 16 Å, making it the brightest TOF low-Q instrument in the world.

Rex Hjelm, 505-665-2372, 505-665-2676 (fax), hjelm@lanl.gov

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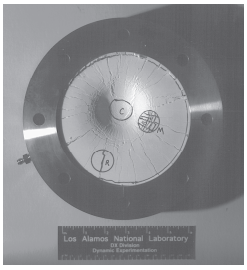
◀ Instrument scientist Rex Hjelm prepares a sample for a study of the behavior of polymers in components using LQD.

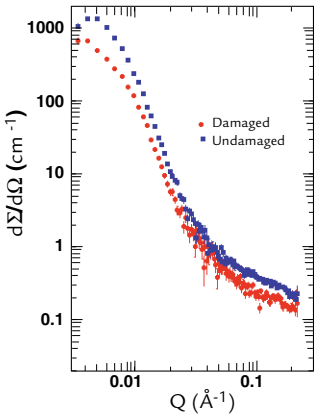
Small Angle Neutron Scattering (SANS) Measurements Reveal Sub-micron Scale Damage Produced by Impact on High-Explosive (HE) Sample

- Character of microstructual voids and cracks strongly influences HE sensitivity
- SANS measurements show that impact produces microstructure (cracks) on a scale smaller than 0.1 microns
- Characterization of bulk HE microstructure on this scale has not been obtainable until now



An Impacted Sample

SANS Data on Damaged and Undamaged HE



LQD Specifications

Wavelength range	1.5 - 15 Å at 20 Hz
Scattering angle	6 - 60 mrad
Q range	0.003 - 0.5 $Å^{-1}$
Typical sample size	10 mm x 13 mm
Detector	Two-dimensional, position-sensitive, proportional counter, 59 cm in diameter
Moderator	Partially coupled liquid hydrogen at 20 K
Sample environment	Air; vacuum, closed-cycle refrigerator; pressure cell (up to 3 kbar); shear cell; or user supplied
Experiment duration	2 minutes - 12 hours